

REMARKS

Claims 1, 2, 4-12, 15-18, and 21-23 are all the claims presently pending in the application. Claim 3 is canceled.

The Examiner considers that claims 6, 11, 12, 16-23 as withdrawn from consideration as being drawn to a non-elected invention or species and there is no allowable generic or linking claim. The Examiner also considers that claims 2, 7-10, 15, and 21 are withdrawn due to previous restriction.

The present invention addresses a specific LCD configuration in which the color filter film is used both for forming the color filter and for covering the thin film transistor, the present inventor has recognized that there are two conflicting requirements of the thickness of the color film layer.

First, the layer must be sufficiently thick to form an adequate pixel color filter region. Second, in contrast, the layer must be sufficiently thin for purpose of allowing a fine pattern for the pixel electrode contact hole to be formed. Prior to the present invention, it was not recognized that the thickness of the color film layer had these two conflicting requirements in this LCD configuration.

It is noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Claims 1, 3-5 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent 5,994,721 to Zhong et al., further in view of US Patent 6,208,399 to Ohta et al.

This rejection is traversed in view of the discussion below.

I. THE CLAIMED INVENTION

Applicant's invention, as defined for example in independent claim 1 (and substantially similarly in independent claims 2, 6, and 7) is directed to an active matrix liquid crystal display device having a first substrate and a second substrate.

At least one of said first substrate and said second substrate is transparent. A plurality of scanning lines is formed on the first substrate. A plurality of signal lines is formed on the first substrate crossing the scanning lines in a matrix manner.

A plurality of thin film transistors is each respectively formed at an intersection of the scanning lines and the signal lines. Each thin film transistor includes a gate electrode formed on said the substrate, a gate insulation layer formed on the gate electrode, a semiconductor layer formed on the gate insulation layer, a drain electrode formed on a first portion of the semiconductor layer and a first portion of the gate insulation layer, and a source electrode formed on a second portion of the semiconductor layer and a second portion of the gate insulation layer.

A passivation film is formed on the thin film transistors. At least one color filter is formed on the first substrate, wherein a color film forming the at least one color filter additionally covers the passivation film.

A plurality of pixel electrodes is each respectively connected to one of the thin film transistors through a contact hole and each respectively is formed on one of said at least one color filter.

A counter electrode is formed on the second substrate. A liquid crystal layer is formed between the first substrate and the second substrate, the liquid crystal layer being driven by electric fields between the pixel electrodes and the counter electrode to thereby make a display.

The color filter is formed directly on the first substrate in most of a light transmission

region by removing the gate insulating layer and the passivation film within a pixel area surrounded by the scanning lines and the signal lines, a thickness of the color film forming the color filter being a preselected first thickness that provides a sufficient chromaticity for the color filter.

The passivation film provides an additional layer over the thin film transistors that reduces a thickness of material of the color filter near the contact hole to a second predetermined thickness chosen to permit a photo-crosslinkage to occur in an entire thickness of the second thickness of the color filter material during an exposure processing of the contact hole. The color filter around the contact hole is thinner than the color filter in the light transmission region by leaving the gate insulating layer and the passivation film around the contact hole.

Thus, it is possible to make a color filter on a contact portion and on a pattern outline portion thin, while the color filter on the pixel opening portion is thick. In this manner, a high photosensitive color resist can be used and a fine pattern with small exposure can be formed. Thus, an LCD having good display quality, high precision and a high aperture can be manufactured (e.g. see page 5, lines 13-24; page 11, lines 25-27; page 12, lines 1-2; page 13, lines 9-18; and page 17, lines 1-12).

Essentially, as described beginning at line 13 of page 3 and continuing through line 10 of page 5, the inventor has recognized that the prior art has a number of problems due to the thickness of the color filter material over the TFT and, more specifically, in the drain region having the contact through hole to the pixel electrode. The present invention solves these problems by reducing the thickness of this color filter material in this region by choosing the number and thicknesses of underlying layers to achieve a thickness of overlying color filter material that will cure without causing the prior art problems in the drain region.

An exemplary configuration of the first embodiment is shown in Figure 3 in which

passivation layer 11 on top of the TFT has a thickness approximately 0.3 μm and the color material on top the TFT has a thickness no greater than 0.4 μm , thereby allowing the material to be cured without causing the problems noted in the prior art. The difference in thickness of the color filter material is further accentuated in the present invention by etching away the gate insulation layer 10 and passivation layer 11 in the pixel area prior to forming the color filter.

In an exemplary configuration of the second embodiment, as shown in Figure 5, an overcoat layer 19 is added on top of the color filter and provides several benefits, as described on page 16, including that of protecting the color filter and acting as a mask for forming the contact through hole, thereby achieving a higher aperture ratio and better display quality than that of embodiment 1.

The conventional systems, such as those discussed below and in the Related Art section of the present application, do not have such a structure, and fail to provide for such an operation.

Such combination of features is clearly not taught or suggested by the cited references.

II. THE PRIOR ART REJECTION

Claims 1 and 3-5 are rejected as unpatentable over Zhong, further in view of Ohta.

Applicant submits, relative to this rejection, that the present invention is clearly distinguished from the combination of Zhong/Ohta, even if such combination were considered proper. In Ohta, the insulating film G1 (the gate insulating layer) and the organic passivation layer PSV2 are not removed from the pixel area, as shown in Figures 2, 21, and 22, respectively. As long as Ohta has no intention to remove these films at the pixel area, there would be no motivation to combine Ohta and Zhong to arrive at the invention defined by claim 1. Accordingly, the present rejection fails to teach or suggest the present invention.

as having the gate insulating layer and the passivation film removed within the pixel area while retaining the gate insulating layer and the passivation film around the contact hole.

The Examiner states on page 9 of the Office Action: "*It is respectfully pointed out that Applied prior art does not need to recognize Applicant's sufficiently thin and sufficiently thin purpose of the claimed invention. The claimed structure results from the combination of applied prior art per rejections above.*"

In response, Applicant submits that the definition in the claims is not that of purpose. Rather, it clearly defines a characteristic of the physical thickness of the color layer in two regions of the pixel area. This depth can be readily measured by one of ordinary skill in the art, once the concept is recognized. As such, Applicant submits that the Examiner simply ignores the plain meaning of the claim limitation in attempting to define this description as a "purpose".

For the reasons stated above, the claimed invention is fully patentable over the cited references.

Further, the other prior art of record has been reviewed, but it too, even in combination with Zhong or Ohta, fails to teach or suggest the claimed invention.

III. FORMAL MATTERS AND CONCLUSION

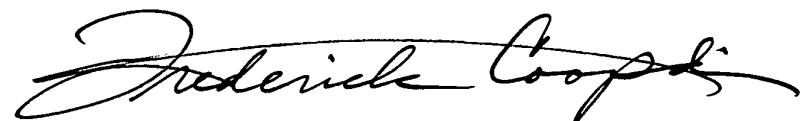
In view of the foregoing, Applicant submits that claims 1-12, 15-18, and 21-23, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: 5/10/05



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